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The electricity sector is among the main sources of greenhouse gas (GHG) emissions; today, those are mainly due to combustion of fossil fuels, but with increasing renewable sources the importance of infrastructures both in electricity generation and in transmission and distribution (T&D) will likely grow. Several studies are available on renewable energy technologies, but only a few on transmission of electricity, and none on its distribution. This study provides life cycle inventory data for electricity distribution networks, and a life cycle GHG accounting of the Danish T&D networks.

The purpose was to evaluate the potential importance of environmental impacts associated with T&D in current and future electricity systems. Including the emissions from electricity T&D is needed to provide a full carbon footprint of electricity systems, and is essential to properly assess the environmental consequences of potential changes in an electricity system. So far, the basis for such assessments has not been available.

The functional unit of this study was the delivery of one kWh of electricity in Denmark. The 2010 Danish electricity T&D networks were modeled, including power lines, transformers, and relevant auxiliary infrastructures.

Electricity T&D provided respectively 29 and 17 gCO_2e/kWh, mainly related to power losses. Emissions from distribution were larger than those from transmission, because of higher losses and higher complexity and material consumption. Large differences were found between overhead and underground lines (i.e. for 50 kV lines, 3.2 and 17 $kgCO_2e$/km respectively)

A new specific dataset for infrastructures in the distribution network was provided and used to evaluate the role of electricity distribution in Denmark. Both T&D provided non-negligible emissions. In the future, due to more renewables and decentralized electricity generation, emissions from T&D may become significant compared to electricity generation itself. Consequently, it is recommended that emission from electricity T&D are included in relevant GHG studies.